

Is there an association between ABO blood grouping and periodontal disease? A literature review

MANSOUR AL-ASKAR*

Department of Periodontics and Community Dentistry, College of Dentistry, King Saud University, Riyadh, Saudi Arabia

*Corresponding address: Dr. Mansour Al-Askar; Department of Periodontics and Community Dentistry, College of Dentistry, King Saud University, P.O. Box 60169, Riyadh 11545, Saudi Arabia; Phone: +966 11 467 6648; Fax: +966 11 467 9017; E-mail: perio.implant@yahoo.com

(Received: March 27, 2017; Revised manuscript received: May 11, 2017; Accepted: May 24, 2017)

Abstract: *Introduction:* Although several studies have investigated the relationship between ABO blood group and medical diseases, few reports have explored the association with oral diseases, including periodontal disease (PD). *Aim:* The aim of this literature review was to assess the association between the ABO blood grouping and PD. *Methods:* We searched PubMed and Google Scholar databases using the following terms in different combinations: “ABO blood group,” “periodontitis,” “aggressive periodontitis (AP),” “risk factor,” and “Rhesus factor.” Databases were searched for articles published from 1977 to August 2016. Titles and abstracts of articles were screened for English-language papers describing clinical studies, case reports, or retrospective studies of oral health status in patients with different ABO blood groups. Letters to the editor, historic reviews, and articles including unpublished data were excluded. Reference lists of included studies were reviewed for additional original and review studies. *Results:* We identified eight articles describing studies of the relationship between ABO blood groups and PD. The findings suggested a possible genetic basis in the association of the blood group AB with AP. Four studies showed that chronic periodontitis was more common among patients with blood group O. *Conclusion:* ABO blood subgroup and Rhesus factor could constitute risk predictors in the development of PD.

Keywords: blood group, periodontitis, aggressive periodontitis, Rhesus factor, genetic

Introduction

Periodontal diseases (PDs) comprise a group of heterogeneous conditions involving inflammation of the alveolar bone, periodontal ligament, and gingiva. PD is typically caused by bacterial infection following the accumulation of dental plaque. PD can lead to destruction of the structures surrounding the teeth when left untreated [1]. In addition to the infectious etiology, increasing evidence suggests that PD may involve a chronic immune-inflammatory response. PD has been associated with various environmental and host factors, including diabetes mellitus and smoking habit. Severity of PD does not appear to be strongly associated with the amount of bacteria in plaque, and some researchers have suggested a possible role of genetic effects [2].

ABO blood grouping was first described by Karl Landsteiner in 1900, based on the presence or absence of

specific antigens on the human red blood cell (RBC) membrane. Blood type is classified as group A, B, O, or AB depending on whether the RBC membranes contain antigen A, antigen B, neither antigen, or both antigens, respectively [3]. In addition to its importance in blood transfusion and organ transplantation, ABO blood grouping influences other physiological characteristics [4]. For example, group A has been associated with increased risks of gallstones, colitis, and certain tumor types [5–7], whereas non-O blood groups have been associated with cardiovascular diseases [8–10], including ischemic heart disease and atherosclerosis [9, 11–13].

Few studies have investigated the association between ABO blood groups and oral diseases, specifically PD. The aim of this literature review was to assess the association between the ABO blood grouping and PD, and to elucidate the possible underlying mechanisms for such an association.

This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium for non-commercial purposes, provided the original author and source are credited.

Materials and Methods

The focused question of this study was “Is there a potential relationship between PD and ABO blood group?” To address this question, we searched electronic databases, including PubMed/MEDLINE (National Library of Medicine, Washington, DC) and Google Scholar, for articles addressing the potential relationship between PD and ABO blood group. Databases were searched for articles published from 1977 to August 2016, using the following search terms in different combinations: “ABO blood group,” “periodontitis,” “gingivitis,” “aggressive periodontitis (AP),” “dental health,” “risk factor,” and “Rhesus factor.” English version of papers describing clinical studies, case reports, or retrospective studies of oral health status in patients with different ABO blood groups were considered for inclusion. Letters to

the editor, historic reviews, and articles including unpublished data were excluded.

Titles and abstracts of obtained articles were screened by the author. Full texts were obtained for articles deemed to be relevant and were independently evaluated for the stated eligibility criteria. Reference lists were hand-screened for additional original and review studies. As only a limited number of original studies addressed our focused question, we structured this review to summarize the pertinent information.

Results

Our search retrieved eight papers from the literature. *Table I* summarizes the major features of each study.

Table I | Summary of studies of the association of aggressive or chronic periodontitis with ABO blood group

Author	Title	Year of publication	Location	Type of study	Subjects	Prominent blood group
<i>Aggressive periodontitis</i>						
Kaslick et al.	Investigation of periodontosis with periodontitis: Literature survey and findings based on ABO blood groups	1971	USA	A Cross-Sectional Study	11	B
Arowojolu et al.	The relationship between juvenile and non-juvenile periodontitis, ABO blood groups and haemoglobin types	2002	Nigeria	A Cross-Sectional Study	40	B/AB
Kundu et al.	Aggressive periodontitis: A clinico-hematological appraisal	2014	India	A Cross-Sectional Study	45	AB
<i>Chronic periodontitis</i>						
Demir et al.	The effect of ABO blood types on periodontal status	2007	Turkey	A Cross-Sectional Study	1,351	O
Koregol et al.	ABO blood groups and Rhesus factor: An exploring link to periodontal diseases.	2010	India	A Cross-Sectional Study	1,220	O
Vivek et al.	Association of ABO blood group and Rh factor with periodontal disease in a population of Virajpet, Karnataka: A cross-sectional study	2013	India	A Cross-Sectional Study	220	O
Kundu et al.	Aggressive periodontitis: A clinico-hematological appraisal	2014	India	A Cross-Sectional Study	45	O
Pai et al.	Correlation between “ABO” blood group phenotypes and periodontal disease: Prevalence in south Kanara district, Karnataka state, India	2012	India	A Cross-Sectional Study	750	B
Pradhan et al.	The relationship between periodontal disease and blood groups and secretor status	1971	India	A Cross-Sectional Study	800	Not detected

Association of ABO blood group with incidence of AP

Although AP generally affects systemically healthy individuals [14], the disease has been associated with several genetic and inherited disorders. One potential marker of risk of AP is human leukocyte antigen (HLA) A9 or B15. Patients with these HLAs showed 1.5–3.5 times increased risk of AP compared with patients carrying other HLAs [15].

Only three of the reviewed studies investigated the relationship between AP and ABO blood groups. Kaslick et al. [16] found a significant association between increased incidence of AP and blood group B, while in blood group O found reduced incidence of AP. Arowojolu et al. [17] examined the association between ABO blood group and juvenile periodontitis (JP) among 40 adolescents in Nigeria. All 20 patients with JP had Rhesus-positive blood from group B or AB. The remaining non-JP patients had Rhesus-positive or -negative blood from group B, O, or AB. In a study of 45 patients, Kundu et al. [18] found that patients with AP ($n = 15$) most frequently had group AB (60%) or group O (40%) blood type. Overall, the findings from these studies suggest a possible genetic basis in the association of group AB blood type with incidence of AP, although the small sample sizes of the studies preclude the ability to make definitive conclusions on the relationship.

Association of ABO blood group with incidence of chronic periodontitis (CP)

A few articles found a relationship between ABO blood group and incidence of CP, whereas other studies found no such association. Differences between studies were attributed to geographical diversity between populations. Four studies [3, 18–20] found that periodontitis was more common among patients with blood group O, whereas the fifth study [21] found an association with blood group B. Pradhan et al. [22] failed to show any significant association between blood group and PD.

Differential secretion of blood group antigens ABO (H) in the tissues may be a factor influencing the development of systemic oral diseases [23]. Differentiation and maturation of cells in the stratified epithelium influence the expression of different histo-blood group antigens. Basal cells express A/B precursor carbohydrate chains, whereas A and B antigens are more commonly found in the spinous cell layer. Expression of blood group antigens also depends on the differentiation patterns of keratinized versus non-keratinized epithelium. Keratinized squamous epithelium rarely expresses A or B antigen, with most spinous cells expressing the precursor H antigen. In non-keratinized epithelium, including the buccal mucosa, most spinous cells express A and B antigens, rather than precursor H antigen. In

the oral tissues, the presence of A/B transferases and their substrates determines the expression of A/B antigens [23].

Suggestions for future research

Four previous studies [2, 17–19] found that blood group O may act as a predictive factor for PD development. For definitive establishment of this role, multicenter collaborative studies are needed. These studies should include diverse population groups from multiple geographic regions and should explore whether there is any genetic basis for the relationship. Detailed analyses of the interaction of the gingival epithelium with RBC surface antigens may provide new insights into the association between ABO blood groups and PD. Animal models of the ABO genes could be used to confirm the possible correlation of blood groups with PD. Results from this literature review indicate that this relationship has yet to be investigated in detail.

Conclusions

Based on our review of the literature, we conclude that ABO blood subgroup and Rhesus factor could be considered as risk predictors in the development of PD. The ABO blood group must be included in the electronic medical record for blood transfusion purposes and could be useful for further correlations with PD for research purposes.

* * *

Funding sources: There were no external sources of funding for this study.

Author's contribution: MA-A prepared the manuscript, had full access to all of the data in this study, and takes full responsibility for the integrity of the data and the accuracy of the data analysis.

Conflict of interest: The author declares no conflict of interest related to this study.

Ethical approval: None.

References

- Listgarten MA: A perspective on periodontal diagnosis. *J Clin Periodontol* 13, 175–181 (1986)
- Offenbacher S: Periodontal diseases: Pathogenesis. *Ann Periodontol* 1, 821–878 (1996)
- Demir T, Tezel A, Orbak R, Eltas A, Kara C, Kavrut F: The effect of ABO blood types on periodontal status. *Eur J Dent* 1, 139–143 (2007)
- Skripal IG: ABO system of blood groups in people and their resistance to certain infectious diseases (prognosis). *Mikrobiol Z* 58, 102–108 (1996)

5. Jesch U, Endler PC, Wulkersdorfer B, Spranger H: ABO blood group. Related investigations and their association with defined pathologies. *ScientificWorldJournal* 7, 1151–1154 (2007)
6. Hamper K, Caselitz J, Seifert G, Seitz R, Poschmann A: The occurrence of blood group substances (A, B, H, Le-a, Le-b) in salivary glands and salivary gland tumors. An immunohistochemical investigation. *J Oral Pathol* 15, 334–338 (1986)
7. Henderson J, Seagroatt V, Goldacre M: Ovarian cancer and ABO blood groups. *J Epidemiol Community Health* 47, 287–289 (1993)
8. Skaik YA: ABO blood groups and myocardial infarction among Palestinians. *Ann Card Anaesth* 12, 173–174 (2009)
9. Biswas J, Islam MA, Rudra S, Haque MA, Bhuiyan ZR, Husain M, Mamun AA: Relationship between blood groups and coronary artery disease. *Mymensingh Med J* 17, S22–S27 (2008)
10. Nydegger UE, Wuillemin WA, Julmy F, Meyer BJ, Carrel TP: Association of ABO histo-blood group B allele with myocardial infarction. *Eur J Immunogenet* 30, 201–206 (2003)
11. Whincup PH, Cook DG, Phillips AN, Shaper AG: ABO blood group and ischaemic heart disease in British men. *BMJ* 300, 1679–1682 (1990)
12. Mitchell JR: An association between ABO blood-group distribution and geographical differences in death-rates. *Lancet* 1, 295–297 (1977)
13. Stakishaitis DV, Ivashkiavichene LI, Narvilene AM: [Atherosclerosis of the coronary arteries and the blood group in the population of Lithuania]. *Vrach Delo* 8, 55–57 (1991)
14. Baer PN: The case for periodontosis as a clinical entity. *J Periodontol* 42, 516–520 (1971)
15. Sofaer JA: Genetic approaches in the study of periodontal diseases. *J Clin Periodontol* 17, 401–408 (1990)
16. Kaslick RS, Chasens AI, Tuckman MA, Kaufman B: Investigation of periodontosis with periodontitis: Literature survey and findings based on ABO blood groups. *J Periodontol* 42, 420–427 (1971)
17. Arowojolu MO, Dosmu EB, Adingbola TS: The relationship between juvenile and non-juvenile periodontitis, ABO blood groups and haemoglobin types. *Afr J Med Med Sci* 31, 249–252 (2002)
18. Kundu D, Bandyopadhyay P, Nair V, Chowdhury M, Mukherjee S, Nayek M: Aggressive periodontitis: A clinico-hematological appraisal. *J Indian Soc Periodontol* 18, 166–171 (2014)
19. Koregol AC, Raghavendra M, Nainegali S, Kalburgi N, Varma S: ABO blood groups and Rhesus factor: An exploring link to periodontal diseases. *Indian J Dent Res* 21, 364–368 (2010)
20. Vivek S, Jain J, Simon SP, Battur H, Supreetha S, Haridas R: Association of ABO Blood Group and Rh factor with periodontal disease in a population of Virajpet, Karnataka: A cross-sectional study. *J Int Oral Health* 5, 30–34 (2013)
21. Pai GP, Dayakar MM, Shaila M, Dayakar A: Correlation between “ABO” blood group phenotypes and periodontal disease: Prevalence in south Kanara district, Karnataka state, India. *J Indian Soc Periodontol* 16, 519–523 (2012)
22. Pradhan AC, Chawla TN, Samuel KC, Pradhan S: The relationship between periodontal disease and blood groups and secretor status. *J Periodontal Res* 6, 294–300 (1971)
23. Campi C, Escovich L, Valdes V, García Borrás S, Racca L, Racca A, Cotorruelo C, Biondi C: Secretor status and ABH antigens expression in patients with oral lesions. *Med Oral Patol Oral Cir Bucal* 12, E431–E434 (2007)